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New Addition to Pest Management News

For the first time, in this issue of the Pest Management News, we are presenting a new series on IPM Research Highlights. See pages 4 and 5.

Program Management

Status of Southern Pine Beetle in the Southeastern United States

State and Federal forestry agencies are making spring preparations for a sharp increase in SPB (southern pine beetle) activity later this summer. Since the last major southwide outbreak collapsed in 1977, there has been little beetle activity across the South, and most infestations have been restricted to localized outbreaks. Surveillance reports from foresters and pest management specialists now show that beetle activity is increasing from Virginia to Texas. As of May 1, every Southern State, except Oklahoma, Tennessee, and Kentucky, report some activity.

In Virginia, most of the activity is located in 12 counties of the Coastal Plain and Southern Piedmont. Although some of the spots are up to 15 acres in size, they are still not expanding to a wide area. No counties are considered in outbreak status at this time. Most activity in North Carolina is in the eastern counties; more will be known following detection flights in May or June.

The South Carolina State Commission of Forestry reported an outbreak in 17 counties, with some activity occurring in three others. Heavy losses from SPB are expected from the coast to the mountains this summer. An estimated 8.64 million board feet of sawtimber and 18,691 cords of pulpwood are cur-

rently infested on State and privately-owned lands. Salvage of this timber is underway, but it has been hampered by an extremely wet spring.

Georgia Forestry Commission officials are anticipating a severe outbreak in 1983. Pest Management Specialist Terry Price has cautioned forest landowners that the high ratio of green to red infested trees and increasing activity in old growth timber on low, wet sites are strong indicators that a severe outbreak could occur this summer. Surveys by the USDA Forest Service Aerial Survey Team showed a large concentration of spots on the Tallulah and Chattooga Ranger Districts of the Chattahoochee-Oconee National Forest.

In Florida, SPB activity is restricted to the Apalachicola National Forest. Spots have occurred in loblolly pine along the Apalachicola River on the Apalachicola and Wakulla Ranger Districts since last fall. Several million board feet of sawtimber was salvaged from one spot. No spots have been reported on private land.

Recent aerial and ground surveys conducted by the Alabama Forestry Commission show 11 counties in outbreak status, with active spots occurring in 9 others. Ground surveys throughout the State indicate a large number of green infested trees. Activity is present on the National Forests in Alabama but does not warrant suppression efforts at this time.

In Mississippi, most of the activity is in the southwest part of the State. Eight counties are involved in the outbreak. A total of 186 new spots were recently detected on the Bude and Homochitto Districts of the Homochitto National Forest.

SPB activity is low throughout Louisiana except for a few spots in the Florida parishes which adjoin the outbreak area in southwest Mississippi.

The Texas Forest Service expects some problems this summer based on pheromone trap catches of SPB this winter. They believe that the State's intensive campaign to improve the vigor of stands through thinning will minimize the amount of damage compared to previous years. The National Forests in

Texas are experiencing an outbreak on the Yellow-pine District and Four Notch area.

No flights have been conducted in Arkansas to date. However, ground reports indicate increased SPB activity in the southern portion of the State. Numerous spots have been reported from Union, Pike, and Howard Counties. An outbreak is in progress on the Ouachita National Forest.

In summary, SPB populations appear to be increasing across the South. Suppression projects have been initiated in South Carolina, Georgia, Alabama, Mississippi, and, possibly later this summer, in North Carolina. National Forest projects include the Chattahoochee-Oconee National Forests in Georgia, Apalachicola National Forest in Florida, Homochitto National Forest in Mississippi, Ouachita National Forest in Arkansas, and Sabine National Forest in Texas. The situation may be more severe than it presently appears because wet spring and cool night conditions have delayed fading of infested pines.

Salvage of infested timber is the primary suppression tactic. Fortunately, markets for sawtimber are good. Markets for infested pulpwood vary across the South.

This article was prepared by Region 8 State & Private Forestry, Forest Pest Management, 3620 Interstate 85 NE, Doraville, GA 30340.

National Forests in Mississippi Implement SPB Hazard Rating

The Bienville, DeSoto, Holly Springs, Homochitto, and Tombigbee National Forests in Mississippi (1,080,700 acres) are now using the southern pine beetle (SPB) hazard rating system developed by Dr. Peter Lorio of the Southern Forest Experiment Station. Wes Nettleton and Mike Connor, Region 8 Forest Pest Management Entomologists, presented the system to Supervisor's Office and Ranger District personnel at three meetings held in February and March.

Utilizing available forest inventory data such as forest type, stand density, site index, and tree size and/or age, all stands are classified as high, medium or low hazard. The ratings are updated, using field data, as new compartment prescriptions are completed. The system is already being used on the Kisatchie National Forest in Louisiana (See SPB News Nos. 17 and 25).

Stand hazard rating will aid foresters in identifying areas that are susceptible to bark beetle attack. It will be used in the selection of stands to be thinned or regenerated, planning surveillance efforts, and

setting SPB spot control priorities. Anyone seeking further information may contact: Forest Pest Management, USDA Forest Service, 2500 Shreveport Highway, Pineville, LA 71360

Mark Your Calendar — June 19-21, 1984

All the speakers have their final instructions and are working hard on their presentations for the Integrated Forest Pest Management (IFPM) Symposium to be held in Athens, Georgia, June 19-21, 1984. For the first time in the South, you can receive information on the total pest (insects, diseases, vegetation, and animals) complex affecting southern pines. This information, where appropriate, can be incorporated into your forest management planning and operations. The final agenda and registration materials will be available in January 1984.

Issue Number 36 of the Pest Management News listed the speakers for this Symposium. The Program Committee was also listed. Inadvertently, Clark Lantz (U.S. Forest Service — Southern Region) was left out.

The final list of sponsors for the Symposium include: (1) Society of American Foresters-Entomology and Pathology Working Group, (2) Southern Forest Tree Improvement Committee, (3) Auburn University Southern Forest Nursery Management Co-Op, (4) Auburn University Silvicultural Herbicide Co-Op, (5) Integrated Forest Pest Management Co-Op, (6) U.S. Forest Service (Southern Region, Southeastern Forest Experiment Station, Southern Forest Experiment Station), and (7) Forestry Extension.

Transfer of SPB Technology to Honduras Successful

Pest Management News Number 38 reported on Ron Billings' technology transfer efforts during a recent visit to Honduras. While there, he served as a consultant to the USDA Office of International Cooperation and Development, Agency for International Development (AID).

A recent letter from the Director of the Office of Environment and Technology for AID in Honduras indicates that the Honduran Forestry Department has had better than 90 percent success in using the treatments recommended by Dr. Billings for controlling the southern pine beetle on the Yoro District. Nice work, Ron! The Director said that other Districts are becoming infested, and additional technical help may be needed.

IFPM Co-op Accomplishments and Plans Reviewed

The annual meeting of the Integrated Forest Pest Management Cooperative was held at the University of Florida on April 19. Investigators reported on their progress and plans for several projects: 1) Methods for sampling, monitoring and evaluating damage by pests in southern pine seed orchards, 2) biological control of sawflies on slash and longleaf pines, 3) pitch canker disease management [work to be initiated in 1983], 4) evaluation of Timbor as a stump treatment for annosus root rot control, 5) the efficacy of salvage-sanitation cuttings in fusiform-infected slash and loblolly pine plantations, 6) shelterwood regeneration to manage fusiform rust in high hazard areas, 7) best management practices for fusiform rust control in high hazard areas [work to be initiated in 1983], 8) the effects of inoculum reduction on the incidence and severity of fusiform rust, and 9) inventory, assessment and prediction of pest impacts using a Southwide series of plots [in planning stage]. Advisory Council members were pleased with progress to date and supportive of continuing work.

Advisory Council members present included Robert Kucera (Alabama Forestry Commission), Frank Vande Linde (Brunswick Pulp and Paper Company), Clifford Henry (Buckeye Cellulose Corporation), Chairman Lee Draper and Howard Hanna (Container Corporation of America), Harold Hudson, Jr. (Georgia-Pacific Corporation), Charles Hollis (International Paper Company), Eugene Robbins (Owens-Illinois Corporation), and Bud Broerman (Union Camp Corporation). Other attendees included technical representatives from several companies, a representative from Weyerhaeuser Company, and representatives from the University of Florida, Florida Forest Service, and U.S. Forest Service (Southeastern and Southern Forest Experiment Stations and Region 8).

Industrial and Alabama Forestry Commission supporters are expected to continue support for the IFPM Co-op in 1983-84.

Hazard Rating Guide

A new southern pine beetle (SPB) fact sheet describes the Texas Hazard Rating System. This system has also been verified for use in Louisiana and other Gulf Coast areas. It provides hazard ratings that identify a relationship between certain site conditions (pine basal area, average stand height, land form) and the likelihood of SPB attack. These ratings provide valuable guidelines for operational

and planning activities. The fact sheet also describes three methods of applying the Texas hazard rating to a forest ownership. Free copies of Forestry Bulletin R8-FB/P 4, Texas Hazard Rating Guide, can be obtained from the USDA Forest Service, Information Center, 1720 Peachtree Road, NW, Suite 816, Atlanta, Ga. 30367.

Martin C. Birch Severely Injured

Our friend and colleague, Dr. Martin Birch, was involved in a serious automobile accident last November. Many of you will remember Martin for his contribution to the Southern Pine Beetle Program while he was a professor and later head of the Department of Entomology at the University of California, Davis, CA. In 1981 he returned to his home country, England, to accept a position at the University of Oxford.

The accident occurred when he and his family were enroute to a Saturday afternoon gathering. Their car collided head-on with an oncoming vehicle. Martin's wife, Linda, and their two daughters have essentially recovered from their injuries. Martin, however, was seriously injured and will take much longer to recover.

Presently, Martin is a patient at the Rivermead Rehabilitation Centre in Oxford. His progress has been good, but slow. We are sure that Martin would enjoy receiving cards, letters, or even photographs during his recovery. These may be addressed to: Dr. Martin C. Birch, Rivermead Rehabilitation Centre, Abingdon Road, Oxford OX1 4XD, England.

Managing Storm-Damaged Areas

How can you manage your timber to reduce the damage caused by a hurricane, tornado or an ice storm? A new 15-page booklet provides guidelines and recommendations for reducing your losses after a natural disaster occurs. It also recommends preventive measures for stand management in hurricane-risk areas. Generally, natural disasters cause extensive damage by uprooting, wounding, permanently bending trees or breaking main stems, tops, or branches. The booklet discusses management practices to reduce pest-caused problems and sets priorities for the removal of damaged or dying trees to minimize overall losses. Utilization guidelines for beetle-killed pine trees are also provided. For a copy of "How to Evaluate and Manage Storm-Damaged Forest Areas," Forestry Report SA-FR 20, write to USDA Forest Service, Information Center, Suite 816, 1720 Peachtree Road, NW, Atlanta, GA 30367.

IPM Research Highlights

This section provides a timely introduction and description of new technology as it comes available. We encourage you to use the summary as is or to abstract and distribute the material to employees, associates, clients, or cooperators in your own newsletters, fact sheets, technology tips, etc. If you use this information in any way, we would appreciate knowing how it was used and what the response was.

If you need more details, contact the Program or the developer of the technology.

Forestry Investment Analysis Program For the Apple II+ Microcomputer

The FORESTRY INVESTMENT ANALYSIS PROGRAM is designed to do a complete financial analysis of forest management problems. Each analysis is based on an investment case which describes the costs, revenues, and scheduling of management activities. The program is interactive, and very user-friendly. This program is not specific to any forest region or type. Analyses may be done on all forms of forest management investments. However, the user must be able to specify the complete investment case including timber yields.

HARDWARE. The program was written for an APPLE II+ microcomputer with 48K RAM, one disk drive, a monochromatic monitor, and the APPLE DOS 3.3 operating system. Printed output is optional and can be selected from within the program. The program will operate with most printers and interface cards.

PROGRAMS. THE FORESTRY INVESTMENT ANALYSIS PROGRAM is actually a package of several separate, but chained, program segments and data files. Programs are menu-driven. The user can select program options to input and edit data; list investment cases; calculate and list cash flows and results; and save, retrieve, and delete case files. The program also includes a time saving feature called a stack loader. This option allows several cases to be run in sequence without any operator intervention. All programs are written in Apple-soft BASIC. The program contains extensive documentation in the form of help sessions which may be accessed through the main menu. Several test cases are also included on the program diskette.

INPUT. Case data may be entered from the keyboard or from a text file previously saved by the user. Error trapping and correction are built into all input and editing routines. Case data include transactions or forest management activities which generate cash flows, header information, and economic parameter data.

Transactions specify each management activity in the case. These data include the first and last years,

step between them, current cost or price, real rate of value change, timber yield or quantity, units, and products. Header data describe four comment lines. Economic parameters include a tax option (no taxes, amortization, or capitalization of reforestation costs), five discount rates, marginal tax rate for ordinary and capital gain income, investment tax credit, volume and cost basis in timber, cost basis in land, and the inflation rate.

Investment cases may be created and saved on the program diskette in a text file for later retrieval. The case title is assigned as the file name, unless the user enters a different name. Cases are retrieved by selecting from a list of available stored cases.

OUTPUT. The FORESTRY INVESTMENT ANALYSIS PROGRAM has three major output routines. Output is normally displayed on the APPLE's 40 column screen. If selected, printed output is formatted for 80 columns. The first output routine lists the case information and activities as they were input.

The second routine lists all cash flows. This routine displays case information such as acreage, base year, investment length, mean annual timber increment, number of transactions and cash flows, and selected economic parameters. The output shows the year, activity, product, quantity, units, cost or revenue amount, and the cumulative total for each cash flow. If a tax calculation option was selected, tax effects are computed and displayed separately. This tax output lists the costs, revenues, taxes, net income, cumulative cash flow, and value of the depletion account.

The last output routine calculates and lists the results of a financial analysis. Present value of costs and benefits, present net worth, benefit/cost ratio, annual equivalent value, and composite rate of return are computed for each of five discount rates. Internal rate of return is also displayed. If a tax calculation option was selected, results are also computed and listed after income taxes.

RESTRICTIONS. The program is limited to cases with no more than 50 activities and 200 cash flows. Investment length cannot exceed 100 years. Up to 20 cases may be saved in text files on the program disk. Large quantities (greater than about 1,000,000 units) may cause format overflows and screen wrap-around, resulting in hard-to-read outputs.

AVAILABILITY. The FORESTRY INVESTMENT ANALYSIS PROGRAM is available for the APPLE II+ microcomputer. Program listings, disk copies, and user documentation for Version 1.1 are available upon written request from the SOUTHEASTERN CENTER FOR FOREST ECONOMICS RESEARCH, P. O. Box 12254, Research Triangle Park, North Carolina 27709.

FOR FURTHER INFORMATION: Contact Dr. J. Michael Vasievich, Research Forest Economist, or Ronald F. Frebis, Research Forester (919) 541-4221.

Funding for this work came in part through FS Agmt. 20-148, with Duke University and the SE Forest Experiment Station, entitled "Economic analysis of methods for reducing losses from bark beetles of southern pines."

Managing the Southern Pine Beetle in Urban and Rural Settings

Activity of the southern pine beetle (SPB) appears to be increasing throughout much of the South. Widespread tree losses are expected to occur in both forest and urban areas during 1983. SPB outbreaks often recur at 8 to 10 year intervals and last 2 to 3 years before beetle activity drops to low levels again. However, SPB-caused tree mortality can be effectively prevented or minimized in urban and landscape situations, even under outbreak conditions, by using an *integrated pest management* approach that utilizes a number of cultural and chemical treatments.

Since pines that are weak or under stress are more susceptible to SPB attack, the best preventive is to keep them healthy and growing vigorously. Protect pines from construction or logging damage, paving, soil compaction, diseases, and other insect pests that will weaken them. Fertilizing and mulching to conserve soil moisture will improve growth in urban, seed orchard, and recreation areas.

Pines that are growing too close together compete with each other for water and nutrients. The selective removal of some of the trees will improve the growth and vigor of those remaining. If several types of pines can be satisfactorily grown in an area, favor the more SPB-resistant species: loblolly, Virginia, and eastern white pine in the Piedmont and southern Appalachian mountains, and longleaf and slash in the Coastal Plain.

When SPB populations are high in an area, the beetles are so numerous that they can successfully overcome healthy, vigorous pines. Under these conditions, cultural treatments alone may not provide the desired degree of protection against attack. Three insecticides, lindane, chlorpyrifos (Dursban), and fenitrothion (Sumithion) are currently registered for the prevention of SPB attack in high value or special

use areas. These same chemicals will control existing infestations if applied on a timely basis and according to label instructions.

The length of time that any insecticide will effectively prevent SPB attacks depends on several factors, including weather conditions, SPB population levels, and application according to label directions. Studies have shown that lindane provides excellent protection for up to 7 months. Therefore, one lindane application in the spring will provide good protection during the season when the beetles are most active. In addition, it gives some protection during the colder months when SPB activity is low. Two sprays a year would be needed for maximum protection.

More limited studies with fenitrothion indicate that it, too, will effectively protect trees from SPB attack for 6 to 7 months. Chlorpyrifos is as effective as lindane for up to 4 months after treatment.

Where larger numbers of SPB-infested trees are present, sanitation salvage is the most effective means for removing beetle-killed timber and protecting nearby pines. Infested trees must be felled and all infested material removed to a landfill, burned, or thoroughly sprayed (with one of the insecticides discussed earlier) before the beetles emerge from the logs. In warm weather, the time from tree attack until brood adults emerge can be as short as 1 month. Therefore, good detection and fast action are necessary for sanitation salvage to be effective.

A good knowledge of SPB habits, symptoms, and life cycle is important to effectively deal with this destructive pest. Pest management specialists with the Cooperative Extension Service, Federal and State forestry agencies, and several private companies have publications and information that are very helpful. Use their services. (This writeup was adapted from a paper prepared by Don Ham, Clemson University, for the 1983 Spring Issue of the International Society of Arboriculture's Southern Chapter Newsletter.)

SPB Annotated Bibliography Available

An annotated bibliography on the southern pine beetle (*Dendroctonus frontalis* Zimm.) has just been completed. Authored by David L. Kulhavy and Paul C. Johnson, this work is available in published form under the title, "Southern pine beetle: annotated bibliography, 1868-1982." Over 1,200 citations are arranged by author, year, title, source, taxonomy (for major insect species), keywords (for subject areas), and abstracts or annotations. Each entry is numbered. There are three indexes: author, taxonomy, and keys (keywords). The primary insect associates of the southern pine beetle are indexed, as are the major subject areas (keywords) such as controls, population dynamics, integrated pest management, behavioral chemicals, hazard/risk rating, host selection, host resistance, wood utilization, and survey and detection. The publication is being sold for \$10.00 per copy.

The entire FAMULUS file is available for computer-generated searches on author, year, title, source, taxonomy, keys or keywords in any of these fields. Searches are \$10.00 per search, plus \$.10 per citation found. Searches will include material in the published bibliography plus any new information.

Copies of the annotated bibliography may be obtained by sending a money order or check made payable to Stephen F. Austin State University and should be mailed to: School of Forestry, Stephen F.

Austin State University, P. O. Box 6109, SFA Station, Nacogdoches, TX 75962.

FAMULUS searches can be arranged by contacting David L. Kulhavy or the School of Forestry. The telephone number is 409/569-3301.

Review of Host-Bark Beetle Relationships Completed

A comprehensive review of information available on southern pine host systems, with special emphasis on physiological aspects, has been published by the Mississippi Agricultural and Forestry Experiment Station. C. A. Blanche, J. D. Hodges, T. E. Nebeker, and D. M. Moehring have consolidated and synthesized scattered information, analyzed it, and identified knowledge gaps that will assist research managers in setting priorities for needed research on host-bark beetle relationships.

The authors have described southern pine host species, factors contributing to host resistance/susceptibility to beetle attack, the affects of natural and man-caused stress on tree physiology and host condition, the relationships between host condition and brood development and survival, and host-beetle-fungal relationships. They have then analyzed the state-of-the-knowledge and suggested a number of research needs.

Single copies of Bulletin 917, "Southern pine beetle: the host dimension" may be requested from the Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

Additional Projects Funded by IPM Program in FY 1983.

State	Performing organization(s)	Principal investigator(s)	Title of project
Georgia	Univ. of Georgia Texas A&M Univ.	C. W. Berisford L. H. Kudon T. L. Payne	Development and evaluation of a behavioral chemical for southern pine beetle suppression (attractant tactic).
Louisiana	Region 8, S&PF	W. N. Nettleton M. D. Connor	Application of southern pine beetle spot growth models in the Gulf Coastal Plain.
Mississippi	SO For. Exp. Stn.	W. L. Nance T. R. Dell R. C. Froelich E. Shoulders	A yield prediction system for unthinned slash and loblolly pine plantations infected with fusiform rust.
N. Carolina	SE For. Exp. Stn.	J. C. Nord A. S. Jones F. L. Hastings	Evaluation of selected insecticides for control of the black turpentine beetle, <i>Dendroctonus terebrans</i> (Olivier), and evaluation of repellents for prevention of attacks by <i>Dendroctonus</i> and <i>Ips</i> beetles in southern pines.
S. Carolina	Region 8, S&PF	W. H. Hoffard S. W. Oak	Integrated pest management on National Forests: Demonstration project on the Sumter National Forest in South Carolina.

Forest Management Demonstration Areas

In September 1982, the Forest Service, Southern Region, released a Directory of Forest Management Demonstration Areas in the South (General Report SA-GR 24). The areas are located in several States and are set up to illustrate best management practices for landowners, practicing foresters, forest land managers, or knowledgeable layment. The purpose of the demonstration forests is to encourage good management of the South's forest land. Many aspects of forest management may be seen on the respective properties, including insect and disease management. The following forests feature practices for dealing with bark beetles and three major tree pathogens:

State	Name of demonstration forests	Bark beetles			Pathogens		
		SPB	IPS	BTB	Fusiform rust	Annosus root rot	Littleleaf
AL	Patterson Property-Whole						
	Woodlands Mgt. Demonstration	X					X
	Shealey Farms		X				
	Sheffield Forestry						
	Demonstration				X		
	Mary Olive Thomas						
	Demonstration				X		
	Noel Tidwell Farm	X	X	X	X	X	
	Mack Vines Property	X					
GA	Dixon Memorial State Forest			X			
	Holt Walton Exp. Forest			X		X	
MS	Gavin Self-Guided Auto Tours				X		
NC	Bladen Lakes State Forest	X	X	X	X		
	Clemmons State Forest		X	X			
	Holmes State Forest					X	
	Tuttle State Forest		X	X			
TN	Bledsoe State Forest						X
	Prentice Cooper State Forest	X					
TX	W. G. Jones State Forest	X					
	I. D. Fairchild State Forest	X					
	E. O. Siecke State Forest	X					

Copies of the Directory can be obtained by writing USDA Forest Service, Room 816, 1720 Peachtree Rd., NW, Atlanta, GA 30367.

Fact Sheet Revised

Southern Pine Beetle Fact Sheet Number 5, "Insecticides for the Southern Pine Beetle," has been revised. Revision was necessary to include Sumithion 8E (fenitrothion), which has been registered for Southern pine beetle control, as well as to provide more information on preventive and remedial control and point out restrictions on who can apply the materials.

Copies can be obtained by writing to the Information Center, USDA Forest Service, 1720 Peachtree Rd., NW, Atlanta, GA 30367.

Other Publications

Belanger, Roger P.; Godbee, John F; Salvage cutting: a means of reducing losses from fusiform rust in southern pine plantations. In: Proceedings, Thinning southern pine plantations; 1982 May 24-26; Long Beach, MS: Forestry and Harvesting Training Center; 1982: 44-55.

Gagne, J. A.; Wagner, T. L.; Sharpe, P. J. H.; Coulson, R. N.; Fargo, W. S. Reemergence of *Dendroctonus frontalis* (Coleoptera: Scolytidae) at constant temperatures. Environ. Entomol. 11(6): 1216-1222; 1982.

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Hedden, Roy L. Evaluation of loblolly pine thinning regimes for reduction of losses from southern pine beetle attack. In: Proceedings of the 2nd Biennial Southern Silvicultural Research Conference; 1982 November 4-5; Atlanta, GA. Gen. Tech. Rep. SE-24. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1983: 376-386.

Mason, G. N.; Hertel, G. D.; Thatcher, R. C. Southern pine beetle hazard ratings; uses, implementation, and evaluation. In: Proceedings of the 2nd Biennial Southern Silvicultural Research Conference; 1982 November 4-5; Atlanta, GA. Gen. Tech. Rep. SE-24. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1983: 365-370.

Michaels, Patrick J. Weather and the southern pine beetle in Atlantic Coastal and Piedmont regions. In: Preprint Volume of Extended Abstracts: 16th Conference on Agriculture and Forest Meteorology; 1983 April 26-28; Ft. Collins, CO. Boston, MA: American Meteorology Society; 1983: 241-244.

Schmitt, Jeffrey J.; Goyer, Richard A. Consumption rates and predatory habits of *Scoloposcelis mississippiensis* and *Lyctocoris elongatus* (Hemiptera: Anthocoridae) on pine bark beetles. Environ. Entomol. 12(2): 363-367; 1983.

Thatcher, Robert C. Identification and control of insect attack. Forest Farmer, 24th Manual Edition. 42(5): 48-50; 1983.

Discussion of pesticides in this paper does not constitute recommendation of their use or imply that uses discussed here are registered. If pesticides are handled, applied, or disposed of improperly, they can harm humans, domestic animals, desirable plants, and pollinating insects, fish, or other wildlife, and may contaminate water supplies. Use pesticides only when needed and handle them with care. Follow the directions and heed all precautions on the container label.